

WHAT IS CLAIMED IS:

1. A Liquid ejecting method for ejecting liquid using a bubble, comprising the steps of:

using a liquid ejecting head having an
5 ejection outlet for ejecting the liquid, a bubble generating region where a bubble is generated in the liquid, a movable member which is disposed faced to said bubble generating region, and which is
displaceable between a first position and a second
10 position farther from the bubble generating region than the first position and which has a free end at a downstream side thereof;

displacing the movable member from said first position to said second position by pressure based on
15 generation of the bubble in said bubble generating region, wherein said bubble expands more to the downstream side than to the upstream side with respect to a direction toward said ejection outlet by the displacement of said movable member, thus directing
20 said bubble toward said ejection outlet to eject the liquid through the ejection outlet; and

imparting an operation to said liquid ejecting head to normalize a state of the liquid in a liquid flow path for the liquid at least before liquid
25 ejection start or at the time of non-ejection of the liquid.

2. A method according to Claim 1, wherein said operation includes discharging said liquid other than ejecting said liquid on the basis of recording information.

5

3. A method according to Claim 2, wherein a condition of said discharging is changed in accordance with an output of ejection state detecting means for detecting ejection state of said liquid.

10

4. A method according to Claim 2, wherein a condition of said discharging is changed in accordance with an output of ejection liquid viscosity detecting means for detecting an ejection liquid viscosity.

15

5. A method according to Claim 2, wherein a condition of said discharging is changed in accordance with an output of non-ejection period detecting means for detecting non-ejection period.

20

6. A method according to Claim, 2 wherein a condition of said discharging is changed in accordance with an output of ejection liquid temperature estimation means for estimating an ejection liquid temperature.

25

7. A method according to Claim 2, wherein a

condition of said discharging is changed in accordance with an output of ambience humidity detecting means for detecting an ambience humidity.

5 8. A method according to Claim 2, wherein a condition of said discharging is changed in accordance with an output of ejection liquid density detecting means for detecting an ejection liquid density.

10 9. A method according to Claim 2, wherein a discharging condition of said liquid is number of ejections.

15 10. A method according to Claim 2, wherein a discharging condition of said liquid is a pulse width of bubble generation energy application pulse.

20 11. A method according to Claim 2, wherein a discharging condition of said liquid is a bubble generation energy applying voltage.

25 12. A method according to Claim 2, wherein a discharging condition of said liquid is a plurality of pulse widths of bubble generation energy.

13. A method according to Claim 1, wherein said operation includes heating said liquid.

14. A method according to Claim 13, wherein
said heating is effected using heating means provided
in a substrate having bubble generation means for
5 forming said bubble generating region.

15. A method according to Claim 13, wherein
said heating is effected through a supporting member
for supporting said movable member in the form of
10 cantilever.

16. A method according to Claim 15, wherein
said supporting member includes a separation wall for
separating the liquid flow path in fluid communication
15 with said ejection outlet and said bubble generating
region.

17. A method according to Claim 1, wherein
said operation includes vibrating said movable member
20 without ejecting said liquid through said ejection
outlet.

18. A method according to Claim 17, wherein
bubble generation is started to eject the liquid while
25 a meniscus of the liquid is at the ejection outlet is
outward beyond a position in a rest state by the
vibration of said movable member.

19. A method according to Claim 17, wherein
bubble generation is started to eject the liquid while
a meniscus of the liquid is at the ejection outlet is
5 inward beyond a position in a rest state by the
vibration of said movable member.

20. A method according to Claim 17, wherein
said vibration is caused by applying energy to bubble
10 generation means, which is lower than that for
ejecting the liquid.

21. A method according to Claim 20, wherein
said applied energy is lowered by decreasing a pulse
15 width thereof.

22. A method according to Claim 20, wherein
said applied energy is lowered by decreasing a voltage
level thereof.

20

23. A method according to Claim 17, wherein
said bubble generation means has a plurality of heat
generating elements, and said vibration is caused by
one of said heat generating elements which generates
25 bubble not enough to eject said liquid.

24. A liquid ejection apparatus, using a

liquid ejection head having an ejection outlet for
ejecting the liquid, a bubble generating region where
a bubble is generated in the liquid, a movable member
which is disposed faced to said bubble generating
5 region, and which is displaceable between a first
position and a second position farther from the bubble
generating region than the first position and which
has a free end at a downstream side thereof;

wherein the movable member is displaced from
10 said first position to said second position by
pressure based on generation of the bubble in said
bubble generating region, wherein said bubble expands
more to the downstream side than to the upstream side
with respect to a direction toward said ejection
15 outlet by the displacement of said movable member,
thus directing said bubble toward said ejection outlet
to eject the liquid through the ejection outlet; the
improvement comprising:

driving means for imparting an operation to
20 said liquid ejecting head to normalize a state of the
liquid in a liquid flow path for the liquid at least
before liquid ejection start or at the time of non-
ejection of the liquid.

25 25. An apparatus according to Claim 24,
wherein said driving means discharges said liquid
other than ejecting said liquid on the basis of

recording information.

26. An apparatus according to Claim 25,
wherein a condition of said discharging is changed in
5 accordance with an output of ejection state detecting
means for detecting ejection state of said liquid.

27. An apparatus according to Claim 25,
wherein a condition of said discharging is changed in
10 accordance with an output of ejection liquid viscosity
detecting means for detecting an ejection liquid
viscosity.

28. An apparatus according to Claim 25,
15 wherein a condition of said discharging is changed in
accordance with an output of non-ejection period
detecting means for detecting non-ejection period.

29. An apparatus according to Claim 25,
20 wherein a condition of said discharging is changed in
accordance with an output of ejection liquid
temperature estimation means for estimating an
ejection liquid temperature.

25 30. An apparatus according to Claim 25,
wherein a condition of said discharging is changed in
accordance with an output of ambience humidity

detecting means for detecting an ambience humidity.

31. An apparatus according to Claim 25,
wherein a condition of said discharging is changed in
5 accordance with an output of ejection liquid density
detecting means for detecting an ejection liquid
density.

32. An apparatus according to Claim 25,
10 wherein a discharging condition of said liquid is
number of ejections.

33. An apparatus according to Claim 25,
wherein a discharging condition of said liquid is a
15 pulse width of bubble generation energy application
pulse.

34. An apparatus according to Claim 25,
wherein a discharging condition of said liquid is a
20 bubble generation energy applying voltage.

35. An apparatus according to Claim 25,
wherein a discharging condition of said liquid is a
plurality of pulse widths of bubble generation energy.
25

36. A liquid ejecting head for ejecting
liquid using a bubble, comprising:

an ejection outlet for ejecting the liquid:

a bubble generating region for generating the bubble in the liquid:

a movable member which is disposed faced to
5 said bubble generating region, and which is
displaceable between a first position and a second
position farther from the bubble generating region
than the first position and which has a free end at a
downstream side thereof;

10 wherein the movable member is displaced from
said first position to said second position by
pressure based on generation of the bubble in said
bubble generating region, wherein said bubble expands
more to the downstream side than to the upstream side
15 with respect to a direction toward said ejection
outlet by the displacement of said movable member,
thus directing said bubble toward said ejection outlet
to eject the liquid through the ejection outlet; and

means for changing a state of said liquid by
20 changing a temperature of said liquid.

37. A liquid ejection head according to
Claim 36, wherein said temperature changing is
effected using heating means provided in a substrate
25 having bubble generation means for forming said bubble
generating region.

38. A liquid ejection head according to Claim 38, wherein said temperature changing is effected through a supporting member for supporting said movable member in the form of cantilever.

5

39. A liquid ejection head according to Claim 39, wherein said supporting member includes a separation wall for separating the liquid flow path in fluid communication with said ejection outlet and said
10 bubble generating region.

40. A liquid ejecting apparatus comprising a liquid ejecting head as defined in any one of Claims 30-39, and recording material feeding means.

15

41. A liquid ejecting head for ejecting liquid using a bubble, comprising:

an ejection outlet for ejecting the liquid:

a bubble generating region for generating the
20 bubble in the liquid:

a movable member which is disposed faced to said bubble generating region, and which is displaceable between a first position and a second position farther from the bubble generating region
25 than the first position and which has a free end at a downstream side thereof;

wherein the movable member is displaced from

said first position to said second position by pressure based on generation of the bubble in said bubble generating region, wherein said bubble expands more to the downstream side than to the upstream side with respect to a direction toward said ejection outlet by the displacement of said movable member, thus directing said bubble toward said ejection outlet to eject the liquid through the ejection outlet; and liquid moving means for changing a state of said liquid by moving said liquid without ejecting said liquid.

42. A liquid ejection head according to Claim 41, wherein said moving means vibrates said movable member, wherein the vibration is caused by applying energy to bubble generation means, which is lower than that for ejecting the liquid.

43. A liquid ejection head according to Claim 42, wherein said applied energy is lowered by decreasing a pulse width thereof.

44. A liquid ejection head according to Claim 42, wherein said applied energy is lowered by decreasing a voltage level thereof.

45. A liquid ejection head according to

Claim 45, wh rein said bubble generation means has a plurality of heat generating elements, and said vibration is caused by one of said heat generating elements which generates bubble not enough to eject
5 said liquid.

46. A liquid ejection apparatus using a liquid ejection head as defined in any one of Claims 41-45.

10

47. A liquid ejection apparatus for ejecting liquid, comprising:

a liquid ejecting head having an ejection outlet for ejecting the liquid, a bubble generating
15 region where a bubble is generated in the liquid, a movable member which is disposed faced to said bubble generating region, and which is displaceable between a first position and a second position farther from the bubble generating region than the first position and
20 which has a free end at a downstream side thereof;

wherein the movable member is displaced from said first position to said second position by pressure based on generation of the bubble in said bubble generating region, wherein said bubble expands
25 more to the downstream side than to the upstream side with respect to a direction toward said ejection outlet by the displacement of said movabl member,

thus directing said bubble toward said ejection outlet
to eject the liquid through the ejection outlet; and
energy increasing means for making larger
bubble generation energy for ejecting at least during
5 a predetermined period from ejection start than
thereafter.

48. An apparatus according to Claim 47,
wherein said increasing means increases a pulse width
10 the energy.

49. An apparatus according to Claim 47,
wherein said increasing means increases a voltage
level the energy.
15

50. An apparatus according to Claim 47,
wherein said increasing means applies a plurality of
pulses.

20 51. An apparatus according to Claim 47,
wherein said increasing means includes a plurality of
heat generating elements.

52. A liquid ejecting method for ejecting
25 liquid using a bubble, comprising:

using a liquid ejecting head having an
ejection outlet for ejecting the liquid, a bubble

gen rating region where a bubble is generated in the liquid, a movable member which is disposed faced to said bubble generating region, and which is displaceable between a first position and a second position farther from the bubble generating region than the first position and which has a free end at a downstream side thereof;

wherein the movable member is displaced from said first position to said second position by pressure based on generation of the bubble in said bubble generating region, wherein said bubble expands more to the downstream side than to the upstream side with respect to a direction toward said ejection outlet by the displacement of said movable member, thus directing said bubble toward said ejection outlet to eject the liquid through the ejection outlet; and making larger bubble generation energy for ejecting at least during a predetermined period from ejection start than thereafter.

20

53. A liquid ejecting apparatus for effecting recording by ejecting liquid, comprising:
a liquid ejecting head having an ejection outlet for ejecting the liquid, a bubble generating region where a bubble is generated in the liquid, a movable member which is disposed faced to said bubble generating region, and which is displaceable between a

first position and a second position farther from the bubble generating region than the first position and which has a free end at a downstream side thereof;

wherein the movable member is displaced from
5 said first position to said second position by pressure based on generation of the bubble in said bubble generating region, wherein said bubble expands more to the downstream side than to the upstream side with respect to a direction toward said ejection
10 outlet by the displacement of said movable member, thus directing said bubble toward said ejection outlet to eject the liquid through the ejection outlet; and

discharging means for discharging said liquid from the liquid flow path for the liquid to be ejected
15 during a predetermined period in a non-ejection period at least before ejection start, using means partly constituting said liquid ejecting head.

means for changing a state of said liquid by changing a temperature of said liquid .

20 liquid moving means for changing a state of said liquid by moving said liquid without ejecting said liquid; and

energy increasing means for making larger bubble generation energy for ejecting at least during
25 a predetermined period from ejection start than thereafter.